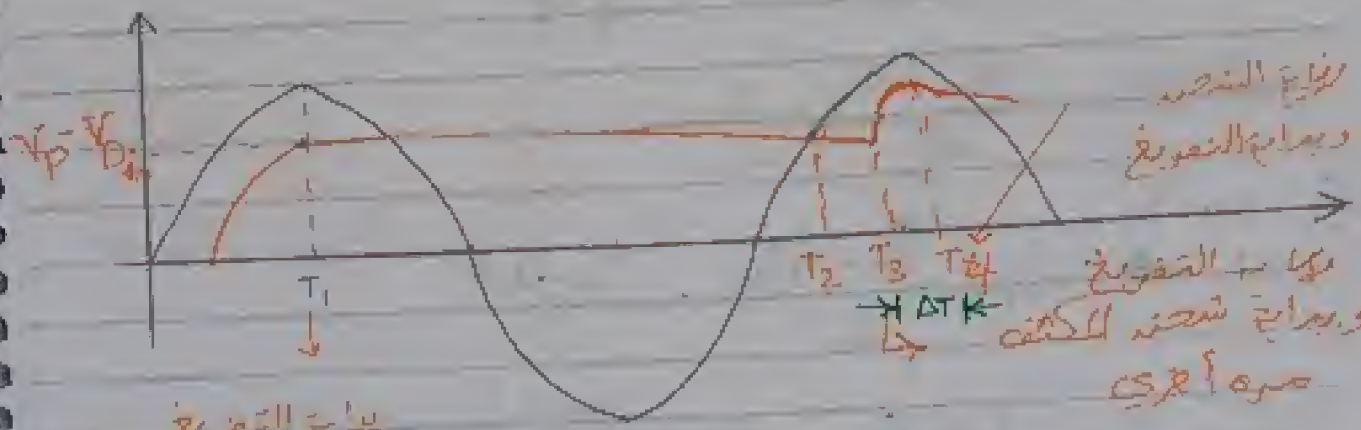
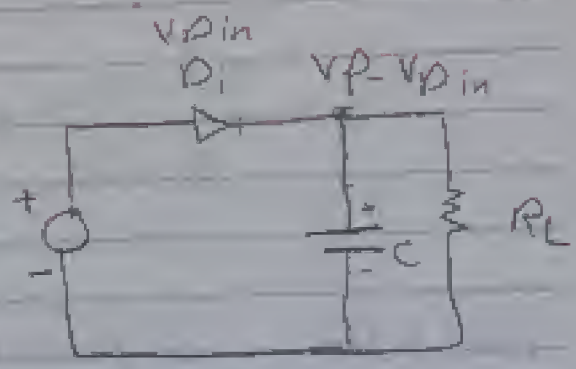
محاضرة 9



بداية التفريغ
"التفريغ في المقاومة"

نهاية الشحن
وبداية التفريغ

هنا بـ التفريغ
وبداية شحن المكثف
مره أخرى



* time Constant ... ثابت الزمن

$$\tau = R_L C$$

* $T_1 - T_4 = T_{in}$ ← الزمن العكسي

↓
تمثل موجة كاملة

$$\rightarrow T_4 - T_3 = \Delta T$$ الفترة الزمنية الشحن

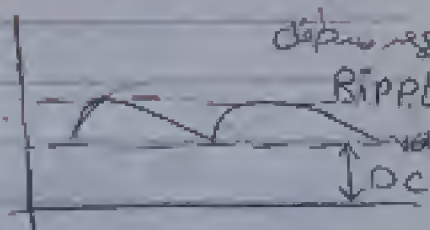
$$\rightarrow V_{out} = V_p - V_{D_{on}}$$

$$V_{out} = (V_p - V_{D_{on}})\, e^{-t/RC}$$

$$\rightarrow T_1 \ll RC$$

$$V_{out} = (V_p - V_{D_{on}})\left(1 - \frac{t}{R_L}\right)$$

$$V_{out} = (V_p - V_{D_{on}})\left(1 - \frac{T_1}{R_L C_1}\right)$$



* نهاية التفريغ عند T_3

*

$$V_{out} = (V_P - V_{D_{in}}) - \frac{V_P - V_{Din}}{R_L C_1} \cdot t$$

$$Ripple = \frac{V_P - V_{in}}{R_L} \; \frac{t}{C}$$

$(t_4 - t_4)$

$\rightarrow T = t_{in} - \Delta T$

$$\rightarrow V_R = \frac{V_P - V_{Din}}{R_L} \cdot \frac{t_{in} - \Delta t}{C}$$

نفرض أن ΔT صغير

$$\rightarrow V_R = \frac{V_P - V_{Din}}{R_L} \cdot \frac{t_{in}}{C}$$

$t_{in} = \frac{1}{f_{in}}$

$$V_R = \frac{V_P - V_{Din}}{R_L \cdot C} * \frac{1}{f_{in}}$$

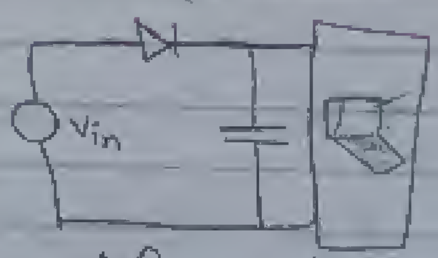
Peak to Peak $P.P = 9V$ ⇐ 60Hz / 110 محول لـ شغل

التردد ← 60Hz ، الجهد ← 110

$$V_R = \frac{V_P - V_{Din}}{R_L \cdot C_1 \cdot f_{in}}$$

$$V_R = \frac{4.5 - 0.8}{.436 * C_1 * 60}$$

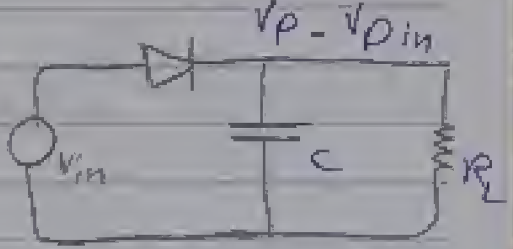
$V_R \rightarrow 0.1$



$\Delta R \simeq .1\ V$

$V_{D_{in}} = 0.8$

Peak Diode Current :-



$\Rightarrow V_p - V_{D_0}$ ⟵ أقصى قيمة للتيار

$\Rightarrow$ at $V_p \gg V_{D_{in}}$

$\Rightarrow V_{in}(t_1) = V_p - V_{D_{in}}$

$V_p = V_{in} \sin(\omega t_1)$ ⟶ زمن مرور أكبر تيار

$\Rightarrow v_{in}(t_1) = V_p \sin \omega t_1$

$\Rightarrow \sin \omega_{in} t_1 = \frac{V_p - V_R}{V_p} = \left(1 - \frac{V_R}{V_p}\right)$

$\Rightarrow V_{out} = V_{in}(t)$

$\longrightarrow V_{in}(t_1) \simeq V_{out} = V_p \sin(\omega_{in} t)$

$\Rightarrow I_D = I_C + I_{R_C} = \frac{V_p}{R_L}$

$I_{D_1}(t) = \left(C \cdot \frac{dv}{dt}\right) + \frac{V_p}{R_L}$

$\therefore I_p = C_1 \omega_{in} V_p \cos \omega_{in} T + \frac{V_p}{R_L}$

$\therefore \cos\theta = (1 - \sin^2\theta)^{1/2}$

$\cos \omega_{in} T_1 = \sqrt{1 - \left(\frac{1 - V_R}{V_p}\right)^2}$

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$$\therefore I_p = C_1 \omega_{in} V_p \sqrt{1 - \left(1 - \frac{V_R}{V_p}\right)^2} + \frac{V_R}{R_L}$$

$$I_p = C_1 \omega_{in} V_p \sqrt{\frac{2V_R}{V_p} - \frac{V_R^2}{R_L^2}} + \frac{V_R}{R_L}$$

[illegible] ≈ 0

$$I_p = C_1 \omega_{in} V_p \sqrt{\frac{2V_R}{V_p}} + \frac{V_R}{R_L}$$

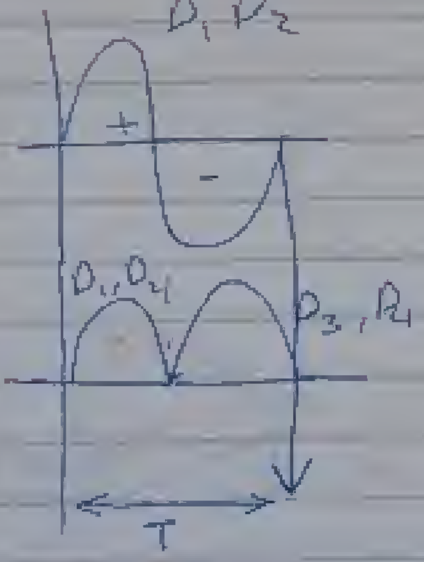
$$I_p \simeq \frac{V_p}{R_L}\left(R_L\, C\, \omega_{in}\sqrt{\frac{2V_R}{V_p}}+1\right)$$

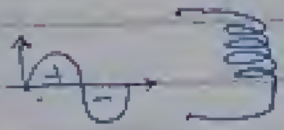
I_p و المكثف

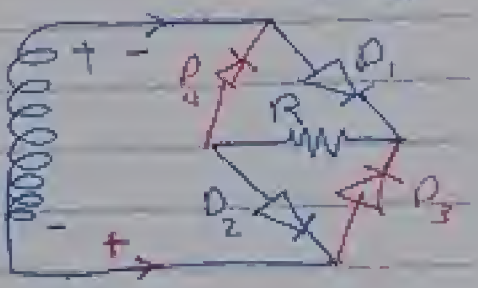
* Full wave Rectifier

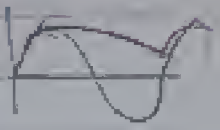
(Bridge Rectifiers)

$R \Rightarrow$



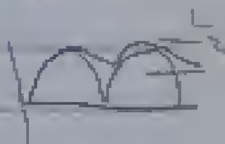






at ½ wave → $V_R = \frac{V_p - 2V_{Din}}{R_L C f_{in}}$

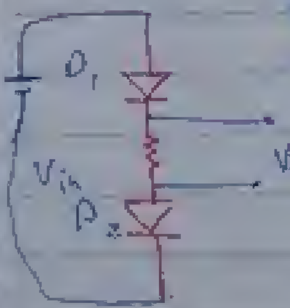
← [illegible] V_R صغيرة



at full wave → $V_R = \frac{1}{2}\,\frac{V_p - 2V_{Din}}{R_L C f_{in}}$

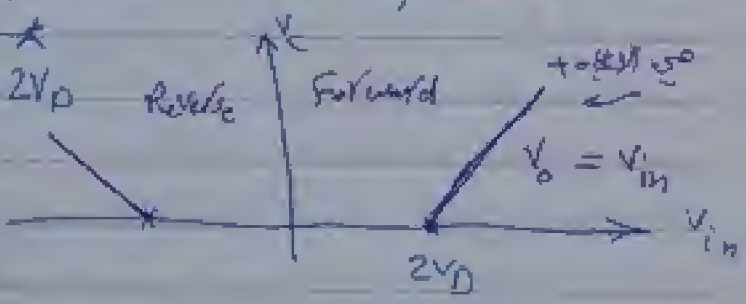
→ at half wave (أقصى) عكسي $2V_p$

at full wave أقصى عكسي V_p — لان الكبير هيتقسم ع ٢ دايود

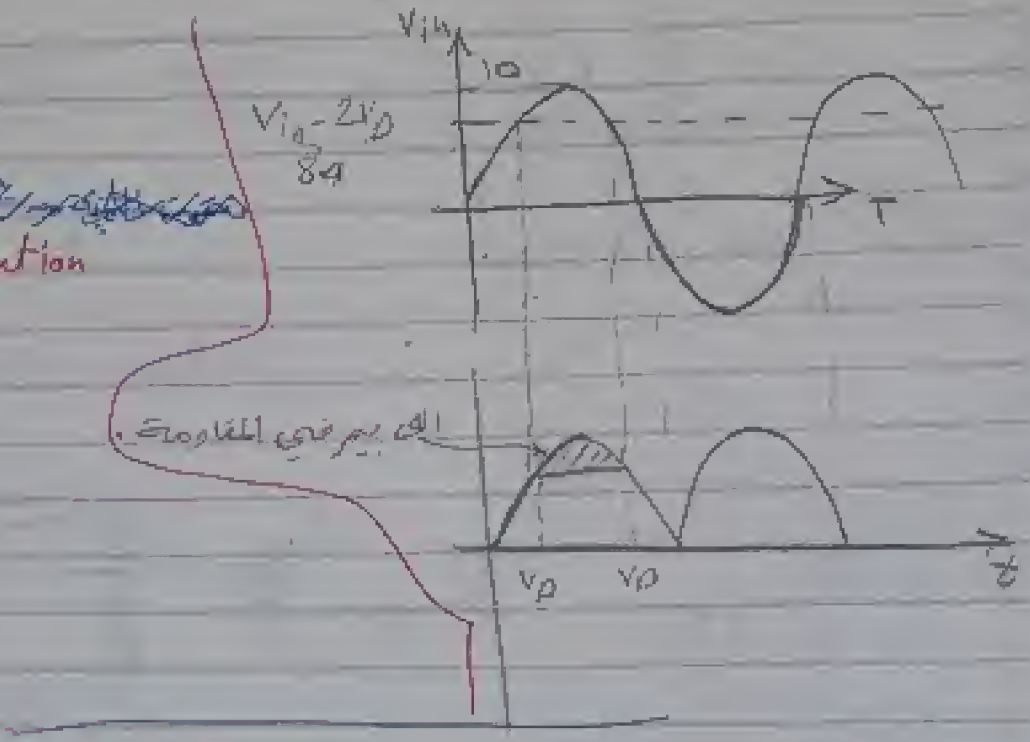


$V_{in} = V_o + V_{D_1} + V_{D_2} = V_o + 2V_D$

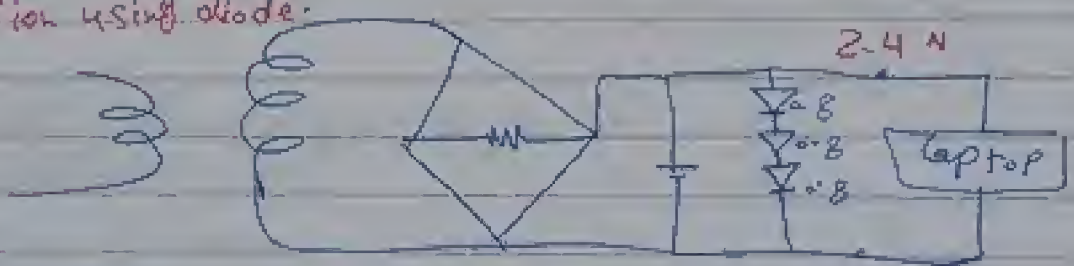
$V_o = V_{in} \mp 2V_D$



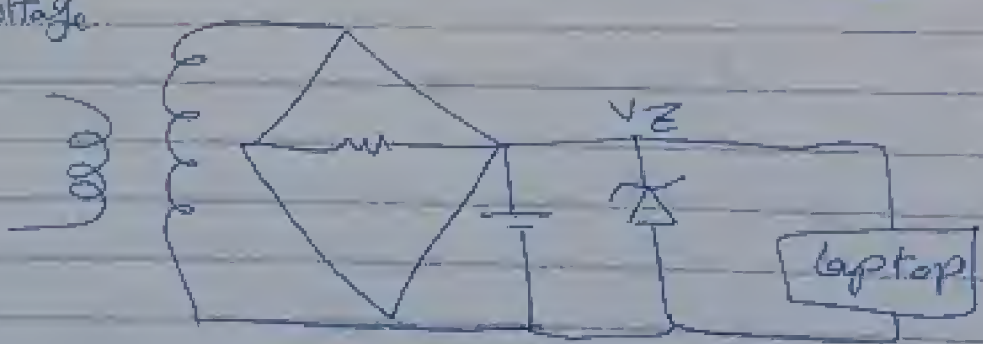
Voltage Regulation

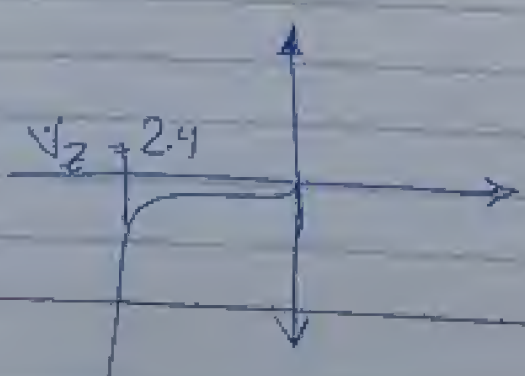


Regulation using diode.



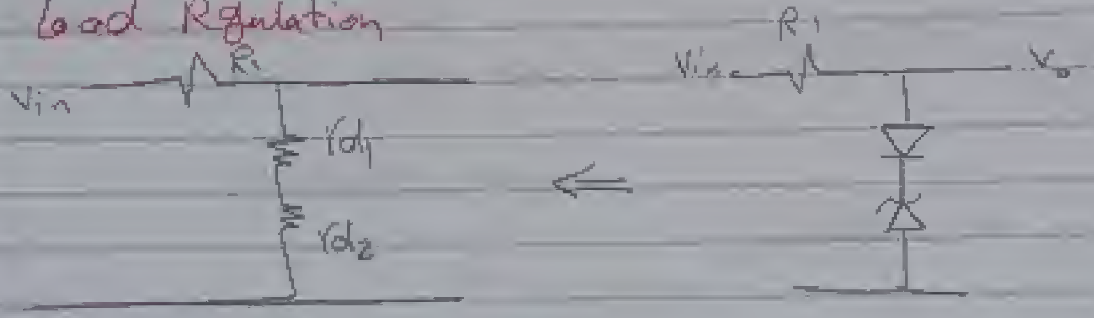
→ Line voltage.





$\frac{V_{in}}{2}$ قيمة ثابتة $V_o = V_{in} \frac{R_D}{R_1 + R_D}$ is Line Regulation

Load Regulation



$$I_{D_1} = \frac{V_{in} - V_{Don} - V_Z}{R_1}$$

(5, .8, 2.1, 1K)

* لو عشنى التيار مايز أعرف إيه مقاومة الـ Diode ديناميك.

∴ ناخد $V_{th} = 26$ VdE,

$$r_{d_1} = \frac{V_{th}}{I_d} = \frac{26\ m.V}{I_{D_1}}$$

Line Regulation

$$\Rightarrow \frac{V_o}{V_{in}} = \frac{r_{d_1} + r_{d_2}}{R_1 + r_{d_1} + r_{d_2}} \rightarrow \text{if } \frac{V_o}{V_{in}} = .06$$

What it Meaning ?!

يعنى $V_o = .06\, V_{in}$ مثلاً لو الدخل اتغير بمقدار 1 فولت ∴ الخرج هيتغير بمقدار .06 فولت

عايزينه قيمة صغيرة علشان تقلل التغير في الفولت.

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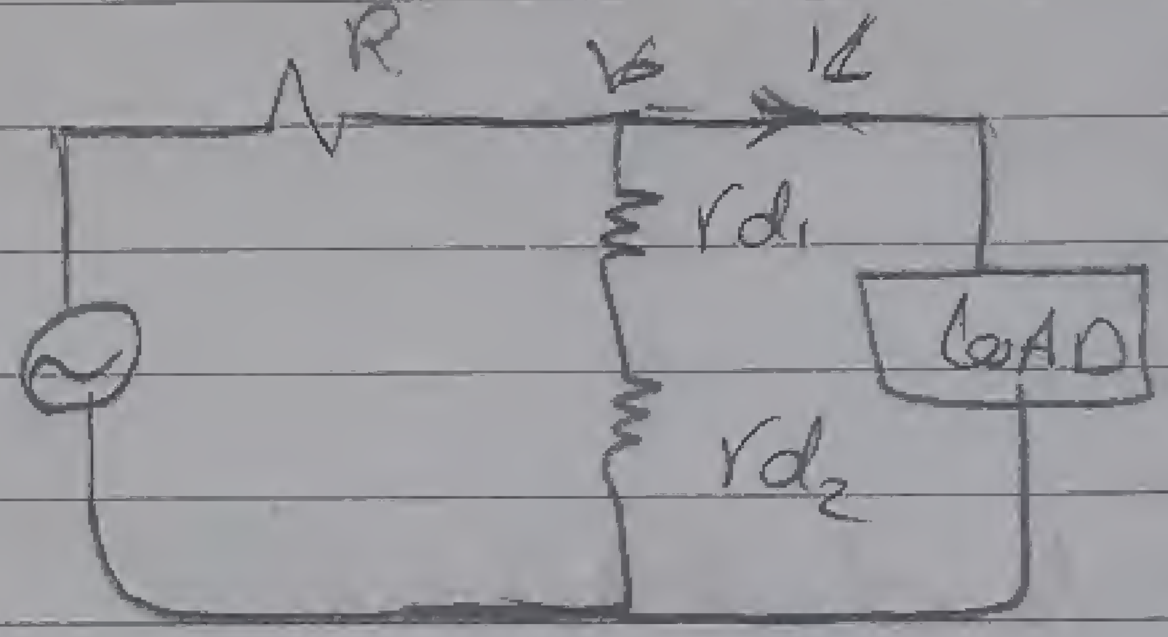
$V_o = \boxed{Pat}\, V_{in}$

لاحظ أن Pat صغير علشان يقلل الإحساس بالتغير في حمل الجهد،



$i_L = \dfrac{-V_{out}}{(r_{d1}+r_{d2})//R_1}$

$\dfrac{\Delta V_o}{\Delta i_L} = (r_{d1}+r_{d2})//R_1 =$ if $\dfrac{\Delta V_o}{\Delta i_l} = 6\,\Omega$

what it Meaning

$\Delta V_o = 6\,\Delta i_l$ → هو اللى يتغير

if $\Delta i_L = 1\,M.A$ $\quad \Delta V_o = 6 \times 1\,M.A = 6\,M.V$

Δil يتقل $\quad$ عايزينها صغيرة علشان

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Limiting circuits